

Committee on Natural Resources

Rob Bishop, Chairman
Hearing Memorandum

May 25, 2018

To: All Committee on Natural Resources Members

From: Majority Committee Staff – Ashley Nichols
Subcommittee on Energy and Mineral Resources (x5-9297)

Hearing: Full Committee oversight hearing entitled “Examining the Natural Gas and Oil Shale Opportunities in Western Colorado”
June 1, 2018, at 2:00PM; Room 213, University Center, Colorado Mesa University

The Full Committee hearing will take place on **June 1, 2018, at 2:00PM, in Meeting Room 213 in the University Center at Colorado Mesa University**. The hearing will examine opportunities for the export of natural gas from the Piceance Basin through the proposed Jordan Cove LNG Terminal in Coos Bay, Oregon. In addition, the hearing will evaluate the potential to develop domestic oil shale resources.

Policy Overview

Exporting Natural Gas from Western Colorado

- The Piceance Basin in Western Colorado contains abundant resources of technically recoverable natural gas. In 2016, the U.S. Geological Survey (USGS) found that the Mancos Shale Formation in the Piceance Basin contains an estimated 66 trillion cubic feet of technically recoverable shale natural gas, 74 million barrels of technically recoverable shale oil, and 45 million barrels of technically recoverable natural gas liquids.¹
- Pembina, an energy transportation and midstream service provider based in Calgary, Alberta, Canada, has proposed to develop the Jordan Cove liquefied natural gas (LNG) terminal in Coos Bay, Oregon, as well as the Pacific Connector Gas Pipeline (PCGP), which will connect the Jordan Cove LNG terminal with other pipelines in the Northwest U.S.^{2 3} These projects would allow natural gas from the Rocky Mountain region, including the Piceance Basin, and elsewhere to be transported to markets in the Pacific Northwest and abroad.⁴

¹ U.S. Geological Survey. USGS Estimates 66 Trillion Cubic Feet of Natural Gas in Colorado’s Mancos Shale Formation. June 8, 2016. <https://www.usgs.gov/news/usgs-estimates-66-trillion-cubic-feet-natural-gas-colorado-s-mancos-shale-formation>

² Jordan Cove LNG. <http://jordancovelng.com/project/location/> (accessed May 17, 2018).

³ Pacific Connector Gas Pipeline. <http://pacificconnectorgp.com/> (accessed May 17, 2018).

⁴ Jordan Cove LNG. <http://jordancovelng.com/project/location/> (accessed May 17, 2018).

- Presently, the proposed Jordan Cove LNG Terminal and PCGP are undergoing regulatory review at the Federal Energy Regulatory Commission (FERC) and a decision is expected in late 2018.⁵
- The opportunity for export LNG through the Jordan Cove terminal could sustain energy development and job growth in western Colorado for years to come. The hearing will review these opportunities, the benefits associated with a robust energy economy in the region, and federal policies to foster greater regulatory certainty and increased investment in federal lands and resources.

The U.S. Oil Shale Opportunity

- The U.S. contains over half of the world's oil shale deposits. In fact, the largest known oil shale deposits are located in the Green River Formation in Colorado, Utah, and Wyoming, which contains in-place resources of 4.2 trillion barrels of oil.⁶
- Oil shale has been produced and used to meet energy demand abroad, in countries including Estonia and Brazil, for decades.⁷ Despite vast domestic oil shale deposits, there is currently no commercial production of oil shale resources in the U.S.⁸
- The Energy Policy Act of 2005 (Public Law 109-58) amended the Mineral Leasing Act (30 U.S.C. 241) to authorize the Department of the Interior to lease federally-owned lands for oil shale development. Of the eight Research, Development & Demonstration (RD&D) leases awarded by Bureau of Land Management (BLM), three are currently operational.
- Private developers have invested significant resources into early-stage oil shale development on RD&D leases in Colorado, Utah and Wyoming. However, unfavorable market conditions, sporadic support from Federal agencies, uncertainty regarding the National Environmental Policy Act of 1969 (NEPA, 42 U.S.C. 4321 et seq.) process and regulatory delays have hampered the industry's ability to develop first-generation oil shale projects in recent years.⁹
- The hearing will review impediments to oil shale development in the U.S. and federal policies to spur greater investment and development of this untapped resource.

⁵ Jordan Cove LNG. Regulatory. <http://jordancovelng.com/project/location/> (accessed May 17, 2018).

⁶ U.S. Geological Survey. Energy Resources Program. Oil Shale. <https://energy.usgs.gov/OilGas/UnconventionalOilGas/OilShale.aspx#3894238-overview> (accessed May 15, 2018)

⁷ Maverick, Tim. The "Always Fuel" of the Future: Kerogen. June 17, 2015. <https://www.wallstreetdaily.com/2015/06/17/kerogen-oil-shale-estonia/>

⁸ U.S. Oil Shale Opportunity. National Oil Shale Association. May 2017.

⁹ U.S. Oil Shale Opportunity. National Oil Shale Association. May 2017.

Invited Witnesses

Gary Aho
Executive Director
National Oil Shale Association
Rifle, CO

Dr. Walter Guidroz
Program Coordinator
Energy Resources Program
U.S. Geological Survey
Reston, VA

Dr. Hossein Kazemi
Professor, Chesebro' Distinguished Chair in Petroleum Engineering
Co-Director, Marathon Center of Excellence for Reservoir Studies
Colorado School of Mines
Golden, CO

Ashley Korenblat
Managing Director
Public Land Solutions
Moab, Utah

David Ludlam
Executive Director
West Slope Oil and Gas Association
Grand Junction, CO

Rose Pugliese
Commissioner
Mesa County, CO

Matt Wurtzbacher
President and Chief Operating Officer
Caerus Oil & Gas
Denver, CO

Background

Jordon Cove LNG Terminal

The Jordan Cove LNG terminal is proposed to be located in Coos Bay, Oregon.¹⁰ The terminal will have the capacity to generate 7.8 million metric tons of LNG annually for export to customers in the Pacific Northwest and abroad.¹¹

The project also includes the PCGP.¹² The proposed 229-mile pipeline which would transport natural gas from existing interstate natural gas pipelines in Malin, Oregon, to the Jordan Cove LNG Terminal.¹³ Once at the terminal, the gas will be liquified and transported to markets abroad, largely in the Pacific Rim.¹⁴

Presently, the proposed Jordan Cove LNG Terminal and PCGP are undergoing regulatory review at FERC.¹⁵ FERC is an independent agency of the federal government that regulates interstate transmission of electricity and oil and natural gas, in addition to proposed LNG terminals, interstate natural gas pipelines and hydropower projects. Before issuing approval, the agency must conduct an environmental review of the proposed projects under NEPA. The agency will develop an Environmental Impact Statement, analyzing the potential impacts of the projects, and issue a final decision on the Jordan Cove proposals.¹⁶

FERC previously rejected the project in March 2016, citing uncertain commercial viability and noting that the company had not yet secured the necessary rights-of-way for the pipeline.¹⁷ In December 2016, FERC rejected a request to reconsider the proposal.¹⁸ In September 2017, Veresen Inc., which was later acquired by Pembina, submitted revised applications for the terminal and the pipeline to FERC.¹⁹ A final decision from the agency is expected in late 2018.²⁰

In addition to FERC approval, the projects will require permits from several federal agencies. The Army Corps of Engineers must issue permits under the Clean Water Act (33 U.S.C. 1251 et seq.) and section 10 permits under the Rivers and Harbors Act of 1899 (33 U.S.C. 403). BLM must issue right-of-way permits for the pipeline with concurrence from the U.S. Forest Service and U.S. Bureau of Reclamation. The Coast Guard must issue a waterway suitability assessment and letter of recommendation. The U.S. Fish and Wildlife Service must

¹⁰ Jordan Cove LNG. Location. <http://jordancovelng.com/project/location/> (Accessed May 17, 2018)

¹¹ Jordan Cove LNG. Location. <http://jordancovelng.com/project/location/> (Accessed May 17, 2018)

¹² Pacific Connector Gas Pipeline. <http://pacificconnectorgp.com/> (Access May 17, 2018)

¹³ Pacific Connector Gas Pipeline. <http://pacificconnectorgp.com/> (Access May 17, 2018)

¹⁴ Pacific Connector Gas Pipeline. <http://pacificconnectorgp.com/> (Access May 17, 2018)

¹⁵ Jordan Cove LNG. Location. <http://jordancovelng.com/project/location/> (Accessed May 17, 2018)

¹⁶ Jordan Cove LNG. Regulatory. <http://jordancovelng.com/project/location/> (accessed May 17, 2018).

¹⁷ Federal Energy Regulatory Commission. Order Denying Applications for Certification and Section 3 Authorization. March 11, 2016. <https://www.ferc.gov/CalendarFiles/20160311154932-CP13-483-000.pdf>

¹⁸ Federal Energy Regulatory Commission. Order Denying Rehearing. December 9, 2016. <https://www.ferc.gov/CalendarFiles/20161209152707-CP13-483-001.pdf>

¹⁹ Jordan Cove LNG. Regulatory. <http://jordancovelng.com/project/location/> (accessed May 17, 2018).

²⁰ Jordan Cove LNG. Regulatory. <http://jordancovelng.com/project/location/> (accessed May 17, 2018).

evaluate the project for compliance with the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) and the National Marine Fisheries Service must analyze compliance with the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 et seq.). The projects must also receive the appropriate permits from the State of Oregon Departments of Energy, Environmental Quality and Land Conservation and Development.²¹

The developer of the project, Pembina, has indicated that it has secured 20-year contracts with two Japanese companies to purchase roughly half of the natural gas transported through the Jordan Cove LNG terminal. One such company is JERA, which procures fuel for Japan's largest electric utilities.²²

Exporting Natural Gas Produced in Colorado

According to Pembina, roughly 25 percent of the natural gas exports through Jordan Cove will be produced in Colorado, most of which would be sourced from the Piceance Basin in Western Colorado.²³

The Piceance Basin contains some of the most abundant natural gas resources in the U.S. In 2016, USGS found that the Mancos Shale Formation in the Piceance Basin contains an estimated 66 trillion cubic feet of technically recoverable shale natural gas, 74 million barrels of technically recoverable shale oil, and 45 million barrels of technically recoverable natural gas liquids.²⁴ In fact, it remains the second-largest natural gas finding ever reported by the USGS, behind the Marcellus Shale in Pennsylvania.²⁵

²¹ Jordan Cove LNG. Regulatory. <http://jordancovelng.com/project/location/> (accessed May 17, 2018).

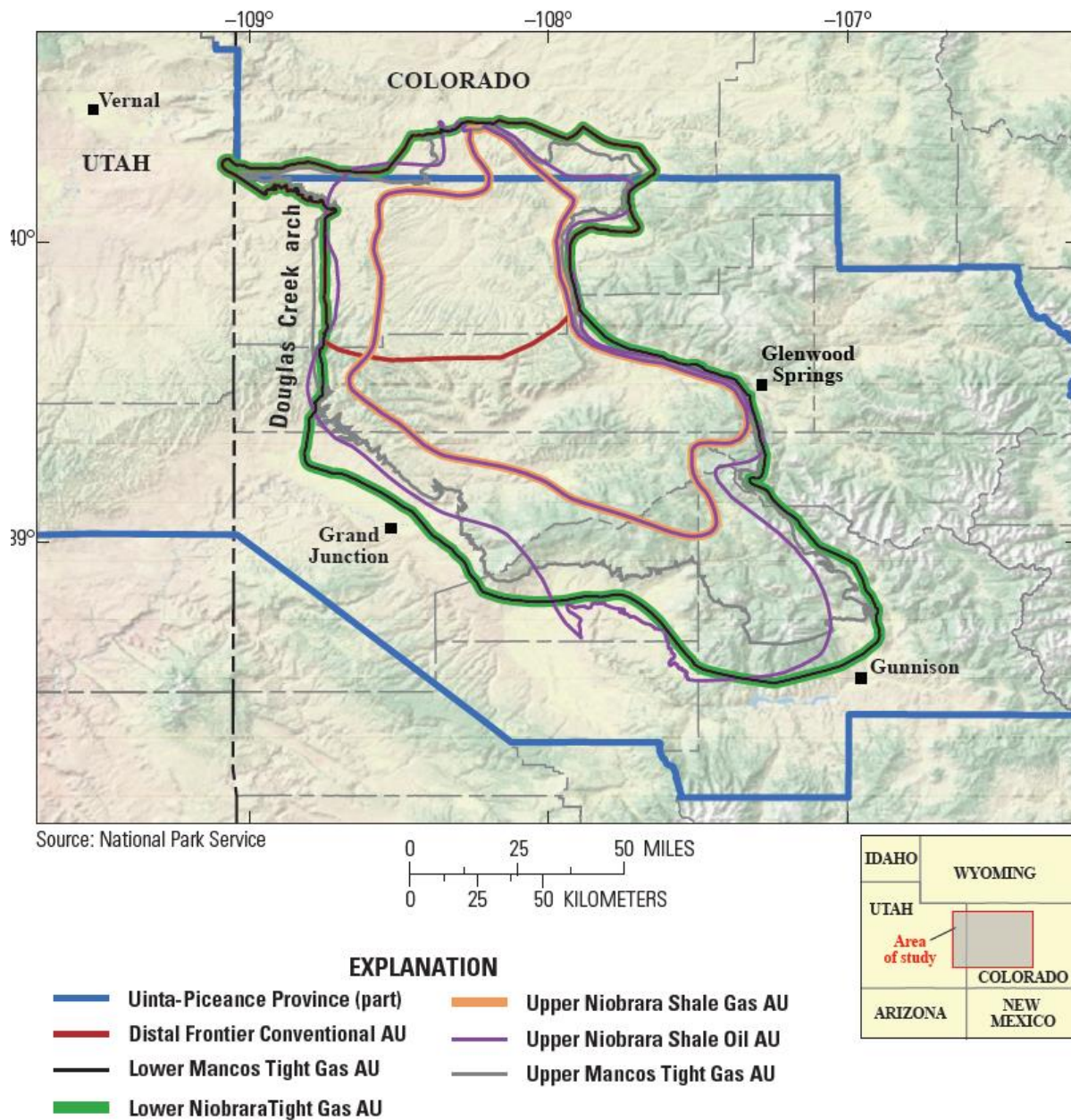
²² Ashby, Charles. Jordan Cove adviser to lawmakers: Project is near reality. March 16, 2018. https://www.gjsentinel.com/news/western_colorado/jordan-cove-adviser-to-lawmakers-project-is-near-reality/article_dc35a934-28df-11e8-8477-10604b9f6eda.html

²³ Ashby, Charles. Jordan Cove adviser to lawmakers: Project is near reality. March 16, 2018. https://www.gjsentinel.com/news/western_colorado/jordan-cove-adviser-to-lawmakers-project-is-near-reality/article_dc35a934-28df-11e8-8477-10604b9f6eda.html

²⁴ U.S. Geological Survey. USGS Estimates 66 Trillion Cubic Feet of Natural Gas in Colorado's Mancos Shale Formation. June 8, 2016. <https://www.usgs.gov/news/usgs-estimates-66-trillion-cubic-feet-natural-gas-colorado-s-mancos-shale-formation>

²⁵ U.S. Geological Survey. USGS Estimates 66 Trillion Cubic Feet of Natural Gas in Colorado's Mancos Shale Formation. June 8, 2016. <https://www.usgs.gov/news/usgs-estimates-66-trillion-cubic-feet-natural-gas-colorado-s-mancos-shale-formation>

2016 Mancos Assessment Map²⁶



An increase in demand for natural gas from the Piceance Basin would support significant economic growth and job creation in this primarily rural area. The opportunity for export through the Jordan Cove terminal could sustain employment in the natural gas industry in western Colorado for years to come.

²⁶U.S. Geological Survey. USGS Estimates 66 Trillion Cubic Feet of Natural Gas in Colorado's Mancos Shale Formation. June 8, 2016. <https://www.usgs.gov/media/images/2016-mancos-assessment-map>

The Oil Shale Opportunity in the U.S.

Oil Shale Resources in the Green River Formation

The term “oil shale,” when referring to the unconventional resource, is a fine-grained sedimentary rock containing organic matter, known as kerogen, which can be heated to produce oil and gas.²⁷²⁸ It is important to note that the term oil shale has also been used to describe oil produced from shales via hydraulic fracturing and directional drilling, which is a separate and distinct industry.²⁹

Over half of the world’s oil shale resources are located in the United States.³⁰ In fact, the largest known oil shale deposits are located in the Green River Formation in Colorado, Utah, and Wyoming, which contain in-place resources of 4.2 trillion barrels of oil.³¹ Specifically, these resources are located in three structural and sedimentary basins: the Piceance Basin in western Colorado, the Uinta Basin in eastern Utah and western Colorado and the Greater Green River Basin in southwest Wyoming and northwest Colorado.³² The Piceance contains roughly 1.5 trillion barrels, the Uinta contains roughly 1.3 trillion barrels, and the Greater Green River Basin contains roughly 1.4 trillion barrels.³³

To date, oil shale deposits in the U.S. have remained largely untapped. While the oil shale industry remains eager to develop this unconventional, yet abundant resource, the technology does not yet exist to enable production on a commercial scale. A lack of consistent support at the federal level, coupled with burdensome regulatory requirements, have slowed the development of new and innovative technologies in this sector. If developed, these resources could provide a source of reliable, domestically produced energy for years to come, high-paying jobs in the oil and gas and mining sectors, and revenues for energy-producing States and the federal government.³⁴

²⁷ U.S. Department of the Interior. Bureau of Land Management. Oil Shale and Tar Sands. <https://www.blm.gov/programs/energy-and-development/mining-and-minerals/oil-shale-and-tar-sands> (Accessed May 15, 2018).

²⁸ U.S. Oil Shale Opportunity. National Oil Shale Association. May 2017.

²⁹ U.S. Oil Shale Opportunity. National Oil Shale Association. May 2017.

³⁰ U.S. Department of the Interior. Bureau of Land Management. Oil Shale and Tar Sands. <https://www.blm.gov/programs/energy-and-development/mining-and-minerals/oil-shale-and-tar-sands> (Accessed May 15, 2018)

³¹ U.S. Geological Survey. Energy Resources Program. Oil Shale. <https://energy.usgs.gov/OilGas/UnconventionalOilGas/OilShale.aspx#3894238-overview> (accessed May 15, 2018).

³² U.S. Geological Survey. Energy Resources Program. Oil Shale. <https://energy.usgs.gov/OilGas/UnconventionalOilGas/OilShale.aspx#3894238-overview> (accessed May 15, 2018).

³³ U.S. Geological Survey. Energy Resources Program. Oil Shale. <https://energy.usgs.gov/OilGas/UnconventionalOilGas/OilShale.aspx#3894238-overview> (accessed May 15, 2018).

³⁴ U.S. Oil Shale Opportunity. National Oil Shale Association. May 2017.

Energy Policy Act of 2005

Oil shale was identified as a strategically important domestic resource by the Energy Policy Act of 2005. In adopting Section 369 of this Act (42 U.S.C. 15927), Congress formally stated its intent to develop this resource to reduce the nation's dependence on foreign resources.³⁵

Specifically, the statute directed the Department of the Interior to lease federal lands in Colorado, Utah, and Wyoming to facilitate research and development of oil shale recovery technologies. This statute also directed the Department of the Interior to conduct a national assessment of oil shale resources, focusing on the resource-rich Green River Region in Colorado, Utah and Wyoming, and the Devonian oil shales in the eastern U.S.³⁶

Moreover, the law authorized the Department of Energy to develop a program to promote the commercial development of oil shale and to provide technical and cost-sharing assistance for the development of oil shale technologies.³⁷ Additionally, the statute directed the Secretary of Defense to develop a strategy for using fuel produced from oil shale and other unconventional resources.³⁸

Task Force on Strategic Unconventional Fuels

To ensure a coordinated effort to promote commercial development of strategic unconventional fuels at the federal and State level, Congress established a task force under the Energy Policy Act of 2005. The task force was assembled “to develop a program to coordinate and accelerate the commercial development of strategic unconventional fuels,” including oil shale, and make recommendations to that end.³⁹ The Department of Energy led the task force, which included the Department of the Interior, the Department of Defense, the Governors of impacted States and local government representatives from impacted areas.⁴⁰

The Task Force issued a report titled, “America’s Strategic Unconventional Fuels” in 2007. The report included recommendations for achieving the objectives outlined in the statute of stimulating commercial development of oil shale resources. The report recommended that the federal government use its resources to lower private investment risk by reducing uncertainty for operators. Specifically, the report recommended that the federal government offer technical assistance to develop new technologies, consider co-funding research facilities and establishing research parks near existing oil shale sites, and offer cost-sharing for bench-scale and pilot testing of new technologies and demonstration projects.⁴¹

³⁵ Public Law 109-58.

³⁶ Public Law 109-58.

³⁷ Public Law 109-58.

³⁸ Public Law 109-58.

³⁹ Public Law 109-58.

⁴⁰ Public Law 109-58.

⁴¹ America’s Strategic Unconventional Fuels. Task Force on Strategic Unconventional Fuels. Published September 2007.

BLM Oil Shale Research, Demonstration and Development Program

The Energy Policy Act of 2005 amended the Mineral Leasing Act (30 U.S.C 241) to authorize the Department of the Interior to lease federally-owned lands for oil shale development.⁴² In response to the directives in the law, BLM established the Federal Oil Shale Research, Demonstration and Development (RD&D) program to enable industry to develop and test technologies capable of developing oil shale on a commercial scale.⁴³

In 2008, BLM completed a Final Programmatic Environmental Impact Statement (PEIS) to analyze the impacts of oil shale development and determine where this untapped resource should be developed on federal land. The PEIS identified 2 million acres in 10 resource management plans to be made available for leasing and development of oil shale in Utah, Colorado and Wyoming.⁴⁴

Under the current program, federal leases are first made available for RD&D of oil shale development techniques. After a lessee meets the requirements of the RD&D lease and all federal regulations regarding transition to a commercial lease, BLM may issue a commercial lease to the operator.⁴⁵

After an initial call for lease sale nominations, BLM leased six 160-acre RD&D tracts. These leases included approximately 5,000 acres of preference lease areas, which would be utilized if the research operations conducted on the RD&D leases became commercially viable. In 2009, BLM called for lease sale nominations and issued two additional 160-acre leases with 480-acre preference lease areas.⁴⁶

In 2013, BLM issued an updated PEIS for oil shale leasing and development on federal land.⁴⁷ This Final PEIS reduced the amount of available acreage for RD&D oil shale leases to 678,000 acres in Colorado, Utah and Wyoming. The decision also required further environmental analysis under NEPA before the issuance of a lease and again before authorizing site-specific operations on a lease.⁴⁸

⁴² Public Law 109-58.

⁴³ U.S. Department of the Interior. Bureau of Land Management. Oil Shale and Tar Sands. <https://www.blm.gov/programs/energy-and-development/mining-and-minerals/oil-shale-and-tar-sands> (accessed May 15, 2018).

⁴⁴ Oil Shale and Tar Sands Programmatic EIS Information Center. <http://ostseis.anl.gov/index.cfm> (accessed May 14, 2018).

⁴⁵ U.S. Department of the Interior. Bureau of Land Management. Oil Shale and Tar Sands. <https://www.blm.gov/programs/energy-and-development/mining-and-minerals/oil-shale-and-tar-sands> (accessed May 15, 2018).

⁴⁶ U.S. Department of the Interior. Bureau of Land Management. Oil Shale and Tar Sands. <https://www.blm.gov/programs/energy-and-development/mining-and-minerals/oil-shale-and-tar-sands> (accessed May 15, 2018).

⁴⁷ Oil Shale and Tar Sands Programmatic EIS Information Center. <http://ostseis.anl.gov/index.cfm> (accessed May 14, 2018).

⁴⁸ Oil Shale and Tar Sands Programmatic EIS Information Center. <http://ostseis.anl.gov/index.cfm> (accessed May 14, 2018).

There are currently three RD&D leases in operation on federal land managed by BLM. The other leases were cancelled or allowed to expire due to unfavorable market conditions.

Current Oil Shale Industry

To date, there has been no commercial production of oil shale resources in the U.S.⁴⁹ Private developers have invested significant resources into early-stage oil shale development on RD&D leases in Colorado, Utah and Wyoming. However, unfavorable market conditions, uncertainty regarding the NEPA process and regulatory delays have hampered industry's ability to develop first-generation oil shale projects in recent years.⁵⁰

Nearly 70 percent of domestic recoverable oil shale resources are located on federal land, meaning that the federal government has an important role to play in the potential development of these resources. While some oil shale resources are privately owned, the resources controlled by BLM are well suited for development with existing technologies.⁵¹ Presently, only 33 percent of the areas originally identified for oil shale development in Colorado, Utah and Wyoming, are available for oil shale RD&D leases. The extreme limitations on available acreage, coupled with the regulatory uncertainty associated with the environmental review process, has stymied development of this abundant resource.

Nevertheless, operators continue to invest in oil shale development on private lands. Enervit American Oil, an Estonian company, purchased a sizable oil shale deposit in the Green River Formation in 2011, which may hold roughly 2.6 billion barrels of recoverable oil.⁵² The company has applied for the approval of a utility corridor to support a potential oil shale operation in Uintah County, Utah, near the Colorado border. This operation, known as the "South Project", is on a 30,000-acre property, and would span 7,000 to 9,000 acres of commercial oil shale mining and retorting. BLM must approve rights-of-way for a utility corridor which would support the South Project, even though the project itself is on private land. The company hopes to produce 50,000 barrels of oil per day over 30 years.⁵³

While commercial production has not yet occurred in the U.S., oil shale has been used as an energy resource abroad for decades. In fact, Estonia provides for over 90 percent of its energy needs with oil shale thermal power plants.⁵⁴ In Brazil, Petrobras produces a variety of products from shale oil, including fuel oil, fuel gas, naphtha, liquified gas and sulfur.⁵⁵ Significant oil

⁴⁹ U.S. Oil Shale Opportunity. National Oil Shale Association. May 2017.

⁵⁰ U.S. Oil Shale Opportunity. National Oil Shale Association. May 2017.

⁵¹ U.S. Oil Shale Opportunity. National Oil Shale Association. May 2017.

⁵² Maverick, Tim. The "Always Fuel" of the Future: Kerogen. June 17, 2015.

<https://www.wallstreetdaily.com/2015/06/17/kerogen-oil-shale-estonia/>

⁵³ O'Donoghue, Amy Joi. Could Utah play host to country's largest oil shale operation. May 17, 2018.

<https://www.deseretnews.com/article/900018901/could-utah-play-host-to-countrys-largest-oil-shale-operation.html>

⁵⁴ O'Donoghue, Amy Joi. Could Utah play host to country's largest oil shale operation. May 17, 2018.

<https://www.deseretnews.com/article/900018901/could-utah-play-host-to-countrys-largest-oil-shale-operation.html>

⁵⁵ Petrobras. Shale Industrialization Unit (SIX). <http://www.petrobras.com.br/en/our-activities/main-operations/refineries/shale-industrialization-unit-six.htm> (accessed May 22, 2018).

shale deposits exist in China, Russia, Jordan, Brazil and Morocco, and companies such as Enefit are testing technologies that can be used to produce oil shale resources in these countries.⁵⁶

The federal government has an integral role to play in achieving the commercial development of oil shale resources in the U.S. With significant oil shale resources on federal land, the Department of the Interior and Department of Energy could support private investment and innovative technologies through research and development incentives and regulatory certainty. Such investment and innovation is needed to support demonstration projects to build on the knowledge and technical advancements achieved through previous efforts to develop oil shale resources. These projects could serve as the foundation for a larger commercial industry in the future, creating reliable domestic resources and well-paying jobs in Colorado, Utah and Wyoming.

⁵⁶ Maverick, Tim. The “Always Fuel” of the Future: Kerogen. June 17, 2015. <https://www.wallstreetdaily.com/2015/06/17/kerogen-oil-shale-estonia/>